

## COMBAT SURVIVOR EVADER LOCATOR (CSEL) SYSTEM



### Air Force ACAT III Program

Total Number of Systems:	45,740
Total Program Cost (TY\$):	\$230M
Average Unit Cost (TY\$):	\$5K (per radio)
Full-rate production:	2QFY03

### Prime Contractor

The Boeing Company

### SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The Combat Survivor Evader Locator (CSEL) system-of-systems is designed to provide downed combat aircrew/isolated personnel with the capability to transmit status and position information rapidly to the appropriate Joint Search and Rescue Center (JSRC) as a means to expedite coordinated rescue/extraction. The CSEL system provides the users with satellite communications, precision Global Positioning System (GPS) geo-location, and line-of-sight voice communications capabilities. The CSEL system provides the combat commanders and their maneuver forces with the ability to ensure rapid location and coordinated recovery of isolated personnel, thereby contributing to *full dimensional protection* by means of *information* and *decision superiority*.

The CSEL system consists of newly developed hand-held radios (HHR), CSEL planning computer (CPC) with radio set adapter, unattended Ultra-High Frequency (UHF) base stations (UBS), and software for JSRC workstations. The CSEL system depends upon the existing UHF satellite communication (SATCOM) constellation, Search and Rescue Satellite Aided Tracking (SARSAT) constellation, limited National Assets, GPS satellite constellation, and existing Secret Internet Protocol Router Network (SIPRNET) connectivity to and from the JSRC.

The HHR is capable of generating radio frequency (RF) waveforms for UHF and Very High Frequency (VHF) voice, UHF and VHF data, and select National Asset data communications. It is capable of calculating precision GPS geo-location, and generating swept-tone beacon signals. The voice waveforms are for non-encrypted communications with rescue forces and other HHR operators. The UHF data waveforms are for encrypted, two-way SATCOM linkage to/from the JSRC; encrypted, one-way National Asset linkage to the JSRC; or non-encrypted, one-way SARSAT linkage to the JSRC in global regions above 70 degrees North or South Latitudes. Once calculated by the HHR, the GPS geo-location is transmitted as part of the text in all HHR data transmissions. Other data message content is

derived from listings of “canned” messages available from the menu-driven CSEL software. The swept-tone beacon cannot be used without the Personnel Locator System. The physical size and weight of the HHR is not to exceed that of predecessor survival radios.

The CPC is a laptop computer used to pre-program the HHR through the radio set adapter. GPS initialization, flight-plan waypoints, “safe locations,” frequencies, and identification information is loaded into the HHR, as necessary, before each sortie. Transmission records and HHR status diagnostics may be extracted from the HHR at the completion of each flight.

Four UBS ground installations are planned for global UHF SATCOM coverage. The UBS receives HHR data transmissions via the SATCOM constellation and relays the data over SIPRNET paths to the appropriate JSRC. Messages generated by the JSRC follow the reverse paths to the HHRs communicating with the JSRC. SARSAT and National Asset constellations have their own dedicated base stations and provide received HHR data over the SIPRNET backbone to the UBS.

The JSRC software, currently hosted on SUN workstations, provides the Joint Forces Air Component Commander with the capability to communicate with the individual HHR operators, plan coordinated rescue/extraction missions, and interface with the Theater Battle Management Core System software package used by the Air Operations Center.

The CSEL program is segmented into two parts. Block I provides the full system without Demand Assignment Multiple Access-Compatible (DAMA-C) user-multiplexed satellite connectivity and without full software interoperability, as defined by Defense Information Infrastructure Common Operating Environment (DII COE), Level 7. Block I provides the system hardware to the users as early as possible in FY01 under LRIP approval. Block II will incorporate DAMA-C and DII COE Level 7 capabilities by mid-FY03 in the form of new software loads to the HHR, UBS, and JSRC workstations and hardware upgrades to the UHF Base Stations.

## **BACKGROUND INFORMATION**

The requirement for a robust survival radio that incorporates GPS geo-location capability was originated by a CINCPAC Mission Need Statement, and later validated by the Joint Requirements Oversight Council on February 4, 1992. The program was approved to enter an 18-month, \$30M RDT&E EMD phase in late 1995, and a contract was awarded to Boeing on February 23, 1996. Added requirements for data encryption, DAMA-C connectivity, and DII COE Level 7 interoperability increased the program to 23 months and \$57.2M RDT&E by late 1996.

The CSEL program was placed under DOT&E oversight in spring 1998. AFOTEC conducted an EOA of the program from April-July 1998. The assessment (OA1) included observations from combined DT/OT testing at Ft. Huachuca, AZ; shipboard operations on USS *Essex*; participation in a Joint Rescue Exercise (JREX); participation in the Cope Thunder exercise; and participation in seawater and cold weather testing in Alaska. DOT&E observed test activities in JREX, Cope Thunder, and Alaska testing. As a result of deficiencies found in the 1998 OA1, an LRIP decision was not supported and the CSEL program was restructured to include an additional operational assessment (OA2) in late FY00 and Multi-Service OT&E in early FY02. (OA2 is currently scheduled for February 2001, with an MOT&E in mid 2002). Boeing has since been awarded a Total System Performance Responsibility contract; provided design corrections for the bulk of the deficiencies found during OA1, and conducted DT testing on those corrections in September 1999; redesigned the Controller Module, VHF/UHF Module, and software for the HHR; and initiated design of a GPS Selective Availability Anti-Spoofing Module (SAASM). Design

defects in the SAASM (CINCO II ship problem and flame-spray processing issue) have resulted in a 4-month delay of the OA2, now re-scheduled for February 2001. OA2 will be conducted on pre-production Block I HHRs to support an LRIP decision for 1,365 HHRs. The program has increased from 18 months to over 72 months, and from \$57M-\$83M RDT&E due to technical challenges and additional requirements definition.

### **TEST & EVALUATION ACTIVITY**

No OT&E testing was scheduled for FY00. The year has been dedicated to the design and fabrication of SAASM components, Controller Modules, VHF/UHF module boards, and software in the HHR units. Component-level and radio-level tests of the HHR test articles have occurred during the last half of the fiscal year and commencement of DT tests will occur in October 2000. Field testing of the pre-production CSEL system was conducted at Ft. Huachuca from November-December 2000. Operational Assessment 2 is scheduled to occur during February and March 2001 in Hawaii and will support an LRIP decision for the Block I configuration in mid-FY01. MOT&E of the LRIP Block I production articles will occur in late FY02; Block II configuration testing will occur in mid-FY03.

### **TEST & EVALUATION ASSESSMENT**

AFOTEC is monitoring the bench test of CSEL components to ascertain correction of defects identified during OA1 testing. The ORD, which was revised to reflect the Block I and Block II accommodation of the CSEL requirements, was approved on February 29, 2000. The TEMP, which is currently under revision to reflect the program restructure, should be submitted for approval in early CY01. The CSEL program is making positive progress. The CINCs have expressed an urgent need for this system. The program office is focused on delivering an operationally effective and suitable product as soon as possible.

### **CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED**

CSEL is not just a hand-held radio. It is a system that includes a hand-held radio, support equipment to program the HHR, an unmanned base station and a software application for the rescue center. The system relies on many other systems including UHF SATCOM, SIPRNET, National Systems, and GPS to perform its mission. It is crucial for test and acquisition personnel to consider the system, not just the radio.

